IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: Toni KOPRA

Invention: **LOCATION AWARE PRODUCT PLACEMENT
AND ADVERTISING**

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SPECIFICATION

To all whom it may concern:

Be it known that I, Toni KOPRA, a citizen of

Finland, residing at Servin Maijan Tie 3 D 23, FIN-02150

Espoo, Finland, have invented certain new and useful

improvements in

LOCATION AWARE PRODUCT PLACEMENT AND ADVERTISING

of which the following is a specification.

LOCATION AWARE PRODUCT PLACEMENT AND ADVERTISING

CROSS-REFERENCE TO RELATED APPLICATIONS

5   This application is related to my U.S. Patent

Application entitled "Chat System for a Specific

Location" (Docket No. 017.38082X00); my U.S. Patent

Application entitled "Video Message Sending" (Docket No.

017.38080X00); and my U.S. Patent Application entitled

10   "Navigation Aware News Service" (Docket No.

017.38079X00), all of which are being filed on even date

herewith and all of which are hereby incorporated by

reference.

15   **BACKGROUND OF THE INVENTION**

FIELD OF THE INVENTION

       The present invention relates to the field of

telecommunications. In particular, the present invention

20   relates to a technique for selectively providing product

placement and advertising to mobile terminals based on

the location of the mobile terminals.

DESCRIPTION OF THE RELATED ART

In product placements, a particular product is intentionally included in a movie or television program. In conventional advertising, an advertisement is widely distributed in order to be seen or heard by the general public. Such techniques are only modestly effective in building general brand awareness. It is more desirable to target advertisements to customers who are known to have the inclination or potential to immediately purchase or make further inquiry about the product.

With the widespread use of the Internet, banner ads have generally come into use on websites, but they are inefficient and not particularly cost effective. Consequently, advertisers have begun to utilize the Internet for targeted advertising products and services.

U.S. Patent No. 5,937,392 to Alberts, entitled "Banner Advertising Display System and Method With Frequency of Advertisement Control," has attempted to alleviate the untargeted advertising problem by specifically targeting advertisements to users from a particular geographic location, etc.

U.S. Patent No. 5,948,061, to Merriman et al, entitled "Method of Delivery, Targeting, and Measuring

Advertising Over Networks," discloses an arrangement for the targeting of the delivery of advertisements over the Internet based on the tracking of data with regard to individual users.

5   U.S. Patent No. 5,974,451, to Simmons, entitled "System and Method for Distributing Bulletins to External Computers Accessing Wide Area Computer Networks," targets advertising on the Internet based on a specific request for information from a user.

10   U.S. Patent No. 5,933,811, to Angles et al, entitled "System and Method for Delivering Customized Advertisements Within Interactive Communication Systems," delivers customized advertisements to users on the Internet based on consumer profiles of the users.

15   Lastly, U.S. Patent No. 5,999,912, to Wodarz et al., discloses a dynamic advertising scheduling, display and tracking arrangement for the Internet. In the disclosed arrangement, advertisements are added to a requested web page in accordance with advertisement tag characteristics

20   which include user based characteristics such as age, gender, language, etc., advertisement tag selection based on the time of day or number of times that the

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advertisement has been selected during a specific time
period, etc.

SUMMARY OF THE INVENTION

5   Recent improvements in technology have allowed the
widespread proliferation of higher speed Internet access,
such as 56K modems, Digital Subscriber Line (DSL) and
cable TV Internet connections, etc. These high speed
Internet connections can support video streaming – the

10   transmission of compressed video signals over the
Internet so as to produce picture and sound comparable to
that of a standard television receiver. Furthermore,
high speed data services to mobile terminals are
supported by advanced Third Generation (3G) Universal

15   Mobile Telecommunications System (UMTS) or Global System
for Mobile Communication/General Packet Radio Service
(GSM/GPRS) mobile networks.

       One aspect of the present invention takes advantage
of these advancements by placing products as active

20   hypertext links in images and streaming Internet video so
that the viewer can click on the position of the product
in the image or video to link to information about the
product.

Another aspect of the present invention is that, when the user clicks on such a product placement in video (or other Internet advertisement with a active hypertext link), he is directed to a site where the product is

5   represented and local resellers are listed for immediate purchase of the product. The hypertext link and site are instantly personalized according to the geographical location of the mobile terminal so that the user gets the representation of the product and information of the

10   nearest reseller of the product. They also can be continuously updated as the location of the mobile terminal changes.

BRIEF DESCRIPTION OF THE DRAWINGS

15   The foregoing and a better understanding of the present invention will become more apparent from the following detailed description of example embodiments in the claims when read in connection with the accompanying drawings, all being part of the disclosure of this

20   invention. While the foregoing and following written and illustrated disclosure focuses on disclosing example embodiments of the invention, it should be clearly understood that the same is by way of illustration and

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example only and the invention is not limited thereto.

The spirit and scope of the present invention are limited

only by the terms of the appended claims.

Fig. 1 illustrates an example of the architecture of

5   an Internet system in which an embodiment of the present

invention can be practiced.

Figure 2 depicts a block diagram of digital services

being delivered to a viewer.

Figure 3 depicts a block diagram of the viewer's

10   connectivity and interaction with the provided

interactive services.

Figure 4 depicts a block diagram of the betting

provider architecture.

Figure 5 is a diagram depicting a possible

15   interactive display.

Figure 6 depicts an integrated display with a live

video feed and interactive content.

Figure 7 depicts a betting login page which includes

Login and Password fields for logging on to the

20   interactive service.

Figure 8 depicts a main betting page supplied by the

betting server 120 to the user at logon.

Figure 9 depicts a page showing the status of currently available betting opportunities.

Fig. 10 is an example of a method of operation of a server placing products in Internet video and/or

5   selecting advertisements in accordance with the present invention.

Fig. 11 illustrates an example of a method of providing the user of a mobile terminal with location aware product placement and advertising.

10   Fig. 12 presents different functionalities of the system.

Figure 13 depicts a flowchart of the interactive betting process.

Figure 14 depicts a block diagram of a direct

15   reception scenario.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The numerous innovative teachings of the present application will be described with particular reference to

20   the presently preferred embodiment. However, it should be understood that this class of embodiments provides only a few examples of the many advantageous uses of the innovative teachings herein. In general, statements made

in the specification of the present application do not

necessarily delimit any of the various claimed inventions.

Moreover, some statements may apply to some inventive

features but not to others.

5   The presently preferred embodiment of the disclosed

innovations is the simultaneous reception and display of a

DVB-T signal and display of dynamic or static content on a

television. The static content is like that of a wireless

terminal, e.g., a mobile phone, a media phone, or an

10   electronic book.

Various embodiments of the disclosed method and system

will be described using interactive betting as an example

of interactive content supplied to an end viewer. However,

it should be noted that interactive betting is just one of

15   many services that can be provided with the disclosed

embodiments.

Fig. 1 illustrates an example of the architecture of

an Internet system in which an embodiment of the present

invention can be practiced.

20   A video signal received by TV signal receiver 140 is

inputted into application server 130. As will be

discussed in detail below, the application server 130

adds product placement and/or advertising to the video

signal prior to forwarding it to the mobile terminals of

a plurality of users 153 via Internet 110. Although only the Internet is shown in Fig. 1, it is understood that a wireless communication network is present which provides communication services to the mobile terminals 153,

5   including Internet access. Other service nodes like interactive provider server or betting provider server 120 can be connected to application server 130.

      In the various disclosed embodiments, an interactive application, betting, for example, is facilitated.

10   **Figure 1** depicts a block diagram of the creation, reception, and response to interactive services in the presently preferred embodiment. A television signal **140** is received, compressed, and converted for streaming onto the Internet **110**. Betting information is also created

15   and streamed onto the Internet **110**. A mobile betting client **153** can display the television program **120** and the betting information simultaneously and a viewer can interactively select betting via the mobile betting client **153**. Finally, the mobile betting client **153**

20   transmits information to the host facility **122** by connecting to a network **110** linked with the host facility **122**, for example, the Internet.

Alternatively, a host facility **122** can integrate

data to be supplied to the viewer into the vertical

blanking intervals of the television signal **140** and

broadcast (or stream) the integrated signal. A mobile

5   betting client **153** receives the broadcast integrated

signal and separates the integrated signal into a

television signal and the supplied dynamic or static

data.

Digital broadcast technology allows for services

10   that can present many-to-one, many-to-many, and one-to-

one communication. DVB has defined delivery media for

satellite services (DVB-S, direct-to-home viewing, cable

(DVB-C) run in several countries, and terrestrial, or

"over the air", (DVB-T) planned for 17 countries. Use of

15   return channels enables digital receivers to provide a

variety of services including Internet, television, and

web content. Processing of the digital signal can be

accomplished on a desktop or laptop computer.

Figure 2 depicts a block diagram of digital services

20   being delivered to a viewer. The interfaces for the

media can include, for example, GSM, GSM+, UMTS, ISDN,

PSTN, ATM, and others **202**.   The protocol and interface

enable a cluster of interconnected devices in the home,

each receiving and processing digital broadcast services

204.   A set top box (STB) or integrated receiver-decoder

5   (IRD), such as the d-box™ manufactured by Nokia, Inc.,

206 integrates the services for viewing on a television

208.

The television receiver that incorporates the

invention should include a plug-in PIP module.   Most

10   receivers that incorporate PIP and other features also

include a microprocessor control which, via a suitable

control bus, periodically interrogates certain functional

blocks and modules in the television receiver chassis to

determine whether they are present and, if so, to control

15   their operation.   In the case of a PIP module, polling by

the microprocessor indicates whether the module is

present in the receiver.   If it is, the microprocessor

arranges to switch the composite video signals (from the

tuner and external sources) through the PIP processor and

20   then to the main video processor of the television

receiver, in preference to the normal composite video

produced. Thus, the video processor of the television receiver has its inputs supplied from either the main chassis in the event there is no PIP module or from the PIP processing module.

5   A viewer watches a mobile betting client 153, for example, a digital television, which is able to act as an Internet browser. Commercial applications such as Inet solution enable television/browser functionality. A dial-up connection or other communications device, such

10   as a LAN connection, can provide Internet connectivity. Along with web browsing functions, the mobile betting client is equipped with streaming video and audio reception and display and secure connection capabilities.

Figure 3 depicts a block diagram of the connectivity

15   of the viewer and interaction with the provided interactive services. In the presently preferred embodiment, the mobile betting client 153 receives an integrated digital broadcast signal (DVB-T). Reception of the signal can be accomplished through various means. In the presently

20   preferred embodiment, the mobile betting client receives the signal over a GSM, GSM++, POTS, UMTS, or other type of connection 152. The mobile connection 152 is itself connected to a network such as an extranet, intranet, or

the Internet 110. Mobile connection to the network 116 may take place in a conventional manner over a modem pool 151 with user dial-in and authentication services 150.

Figure 4 depicts a block diagram of the betting provider architecture. In the presently preferred embodiment, the betting provider information is protected from network snooping by a security device such as a firewall 121. At least one betting provider server 122 resides behind the firewall. Software running on the server tracks viewers (bettors) in various competitions.

One task of the server 122 is to authenticate viewers. In the presently preferred embodiment, a user information (UI) database 430 is maintained. The UI database 430 stores usernames and associated passwords, user account information, user preferences, and other user specific information. In addition to tracking viewers, the server 122 receives and accepts bets that have been requested by the viewer to a betting server 120 running on the network side of the firewall 121 and connected to a network such as an extranet, intranet, or the Internet 110. This betting server 120 acts as an interface between interactive services viewers on the network and the actual betting provider.

The betting provider server 122 receives betting content (questions to the user) and the odds of the particular bets from a betting controller 440. The betting controller 440 is responsible for creating betting content,

5   controlling the betting event, *i.e.*, opening and closing of betting, etc. Betting control software is used to enter and calculate betting content and odds and send them to the betting provider server 122. In the presently preferred embodiment, the betting provider server 122 stores the

10   betting content and odds in a database (BCO) 410. The betting controller 440, via betting control software tracks, the results of the betting question and reports the results to the betting provider server 122.

The results of the bets are stored in a database (BR)

15   420. Once the results of a particular question are known and stored by the betting provider server 122, software on the server calculates payments to the bettors on the particular question. In the presently preferred embodiment, electronic accounts stored in the UI database

20   430 are used for tracking betting wins and losses. The results of the event and sub-events (betting questions) are reported to the betting server 120. The mobile betting client 153 can then receive the results from the betting

server 120.

Video and audio streaming of an on-going competition on which viewers may bet is accomplished, in the presently preferred embodiment, through use of a live video/audio streaming server (VAS) 130. The VAS is connected to a network such as an extranet, intranet, or the Internet 110. A live broadcast 140 of a competition is received through an RF receiver at the server. The audio and video components of the signal are separated and digitized. The digitized audio is then compressed using one of several digital compression schemes, for example, H.728, H.729, or GSM. Likewise the digitized video is compressed using a scheme such as MPEG, MVC, H.261, etc. The digitally compressed audio and video are packaged for network transfer *e.g.*, TCP/IP, UDP. The packets are then broadcast to the network 110 controlled by a streaming/multicasting controller.

The mobile betting client 153 has PIP functionality. This functionality allows the viewer to simultaneously view two audio/video broadcasts in the display of the mobile betting client. The two broadcasts can be, for example, the live-feed of a competition in one picture and interactive betting possibilities in another.

Figure 5 is a diagram depicting a possible interactive display. Directions at the top of the display **500** inform the viewer of the status or title of the interactive activity, in this case, betting. For an application such as betting, a dialog-type box **510** is used to inform the viewer of the current question on which bets can be placed. In the context of an auto race, a question such as "Who will turn the fastest 13th lap" may be presented. A pull-down menu or radio button dialog box **520** may be presented depending on the type of question. In the above example, all of the drivers remaining in the race may be presented in a pull-down menu. Dialog boxes specific to wagering: stakes **530**; odds 540; and payout **550**, may also be presented. A statement of account 560 with a betting services provider may also be presented. The account is dynamic throughout the competition, registering winnings and debits as each occurs. A response dialog 570 informing the user of bets being received and the current allowable wagers may also be provided. Such a response window is also dynamically updated as available bets are made or changed. In addition to the displays listed above, dialog boxes presenting last minute betting advice or information can also be displayed. Such advice can include, for

example, up to the minute status of race participants not currently being shown on the broadcast or the injury status of key players at an event. **Figure 6** depicts an integrated display with a live video feed and interactive content.

5   Figure 13 depicts a flowchart of the interactive betting process. First, a mobile betting client wishing to interactively bet connects to the betting provider (Step 1302). Once connected, a secure network connection, using, for example, encryption or secure sockets, is established

10   (Step 1304). Once a secure connection is established, an authentication process occurs, comparing user name and password entered by the client to entries in a database of user information (Step 1306). Once authenticated, the client can select the type of competition to bet on, for

15   example, auto racing, hockey, or football. (Step 1308). If live video and audio is available, the competition is displayed (Step 1310). The interactive betting opportunities currently available for the chosen competition are then displayed to the client (Step 1312).

20   The betting opportunities are dynamic and will be continuously updated. The client informs the betting provider of its desire to bet (Step 1314) and the stakes Step 1316). The stakes can be variable amounts or limited

to selections presented in a choice menu. The betting selection and the stakes are sent to the betting provider across the secure connection (Step 1318). The betting provider verifies the entries made by the client (Step 1320). Further checks, including client payment history and credit reports can be included in this verification step (Step 1320). If any of the entries is invalid, a valid entry is requested (Step 1322). Entries can be invalid for several reasons, for example, incorrect selection, closing of the requested betting selection prior to the bet being received, or the client's inability to cover the stakes.

If the entries are valid, the betting provider informs the client of that the particular wager has been accepted (Step 1324). Different bets open and close during the course of the competition. Once the bet has been made and accepted, the client may continue to view the competition, personally monitoring the outcome of its wager and making other bets on the same competition (Step 132). The client may also choose a different competition to view and possibly bet on (Step 1328). If the client does not wish to view or bet on any other competitions, the connection

between the client and the betting provider is closed (Step 1330).

At some point after the close of a particular wager, the participants are informed of the result and appropriate

5   adjustments to betting accounts are made. If the client is still connected to the betting provider when the results are known, the client can be informed of the results. Otherwise, the client can be informed of the status of any outstanding wagers the next time a connection to the

10   betting provider is established.

In an alternative embodiment, a live broadcast 140 of a competition can be received directly by the mobile betting client 153. Figure 14 depicts a block diagram of a direct reception scenario. The mobile betting client 153

15   can, of course, be at the viewer's home or at another viewing location. The broadcast 140 is displayed in a monitor 1402. Additionally, an Internet browser can be connected to the monitor 1402 or, alternatively, to a separate display 804 in order to interface with the betting

20   server 120 through a switching network 114 and an Internet service provider (ISP) 1406. The PIP property of the monitor can be used if the browser and the broadcast 140 are shown in the same monitor.

In another alternative embodiment, a DVB signal with the live broadcast 140 and betting information from the betting server 120 can be integrated into a digital broadcast.

5   Figure 7 depicts a betting login page which includes Login and Password fields for logging on to the interactive service.   The connection can be established over the Internet using a Virtual Private Network (VPN) tunnel and Secure Sockets Layer (SSL) connection.   Once a secure

10   connection is established, an authentication process occurs in which the users enters his user name and password in separate fields.   If the incorrect user name and password are entered, the login screen is again displayed.   No assumption is made that the mobile betting client has a

15   keyboard or a mouse.   However, the user can edit text with a delete key and navigate with arrow keys or other cursor control in both the horizontal and vertical planes.   I n order to participate in the service, the user will need to register with the betting provider server 122.   New users

20   will need to register.   Registration information includes information about the device the user is connecting with, the bandwidth of the connection, and the style sheet (or skin) the user prefers.   New user generally are kept from

participating in the service until an active betting supervisor or administrator enables the user logon.

Logging on allows users of the service to make bets and watch both live and on-demand streaming broadcasts. Figure 8 depicts a main betting page supplied by the betting server 120 to the user at logon. Information such as the current time, last use, and account balance information is displayed. Information such as the number of other users currently participating can also be displayed. Users can navigate from the main betting page to other pages by navigating with the arrow or cursor control keys.

After the log-in process, the only chance to navigate is downward to reach "lower" folderleaves. Thereafter, the user can navigate up or down in the levels to choose the service. In a preferred embodiment of the invention, there are four main services which can be on different pages or vertically positioned in the display screen. The main page is for betting actions and watching video transmissions. There may also be a news service providing various short messages concerning the games. A settings page allows a user to change their personal settings.

Figure 9 depicts a page showing the status of currently available betting opportunities. The betting window, that is the times during which placed bets will be valid is also displayed. The page functionality is shown as visual or graphical illustrations. The page can contain and present betting information in many different forms, for example, warning lights. The page depicted in Figure 9 has blinking lights in the form of traffic lights 900. The traffic lights are designed to provide advanced notification to the user of situations in the betting window. For example, one situation would be the amount of time left in the betting window. For another example, a change in the betting information which could affect the choice of bets placed. In the presently preferred embodiment, the traffic lights use color to indicate the importance or immediacy of particular information: e.g., red, orange and green.

Fig. 10 illustrates an example of the operation of the application server 130 in an embodiment of the present invention.

After the video signal is received in Step 1010, the application server 130 changes the video signal for embedding (Step 1020). If the video signal is in analog form, the application server 130 needs a tuner and other

circuitry to change the video signal into a preferred
digital format. Application server 130 edits the video
signal to embed product placements in active hypertext
links and/or advertisements, such as banner ads, to the
5   mobile terminals 153 via Internet 110 (Step 1030). (It
should be understood that while this example embodiment
refers to a video signal, application server 130 can also
provide a web site with static or animated images having
product placements in active hypertext links and/or
10   advertisements, such as banner ads.)

The video signal may be edited with the aid of a
contents scanner and/or video analysis engines for
recognizing specific video images and/or may use other
data recognition techniques, if available. The actual
15   choice of the configuration of the contents scanner
and/or video analysis engines would of course depend upon
the content and format of the video signal. In view of
the fact that video signal scanners and analysis engines
are commercially available products (for example, the
20   products of Excalibur Technologies, Mediasite and
Virage), a detailed description of the configuration
thereof has been omitted for the sake of brevity. The
video signal output by application server 130 is thus
tagged or marked with a markup language, such as
25   hypertext markup language (HTML), or contains some other
meta data to reveal the product placement and content
link of the video signal.

In addition to or alternatively to the product

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placement in the video signal, a banner ad can be generated based on the location data corresponding to the user's mobile terminal. A banner ad generator (not shown) in application server 130 receives the location

5   signal derived for a mobile terminal 153 in a manner such as that described below and generates localized banner ads in real-time for that location from an information database. For example, it can maintain a list of auto dealerships and their respective locations, and then

10   provide a banner ad for the closest dealerships.

Alternatively, the banner ad generator may include a list of banner ads stored therein along with a corresponding list of locations related to each banner ad so that it need not actually generate the banner ads.

15   Instead, it provides the banner ads or information already stored therein. The appropriate banner ad is queried from a database and retrieved from a file system. Instead of using a single database, application server 130 can use XML (extensible markup language) and XSL

20   (extensible style language), for example, which each separate content and layout from each other.

For example, if the user of a mobile terminal in Arlington, VA clicks on a banner ad for a particular automobile model or clicks on an active hypertext link

25   associated with such an automobile in a streaming video signal, the banner ad generator selects the banner ad from among the list of banners that is associated with Alexandria, VA. A banner ad can be added to the

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streaming video signal or the streaming video signal can be stopped in order to view an advertisement.

Another example is, if F1 driver Mika Häkkinen is shown in the display driving with his car advertising West the user can select that ad and get information about West. Also the betting service can utilize this system. To the user the F1 car is shown which you have bet. Then the client sees the advertisement of the car he has bet. Therefore the betting can be done in a more personalized way of service. The application server selects the video it will send based on the bets of different cars/drivers.

The web server receives an automatically generated HTML (hyper text markup language) file from the banner ad generator (which may be implemented with Java Servlets or ASP (active server page) or other service side technology in which the customized banner ad has been embedded (Step 1040). The customized banner ad is thus ready to be sent over Hypertext Transfer Protocol (HTTP) upon request from any one of mobile terminals 153 (Step 1050). Alternatively, some type of push technology, e.g., RMI (java remote method invocation), receiver applet, live connection and java script, can be used so that the client gets the right banner ad immediately after the location information of the mobile terminal is received.

Fig. 11 illustrates a method of providing the user of a mobile terminal with location aware product placement and advertising as experienced from the mobile

terminal. The method starts with the user viewing the mobile terminal having a video (or other image or animation) including a product placement with an active hypertext link, either with or without a banner ad (Step 1110).

In Step 1120, the user clicks on the product placement or on a banner ad that has been tagged, e.g., with a markup language or some other meta data.

Once that happens, the mobile terminal (or another element in the mobile communications network in which the mobile terminal is located) is put into contact with application server 130 (Step 1130). The mobile terminal (or other locationing element in the mobile communications network) provides location information informing the server of the location of the mobile terminal (Step 1140).

In step 1150, the banner and location information are combined in application server 130 to determine a match. That is, is there a suitable banner ad to be embedded in an html page to provide location sensitive information to mobile terminal 153.

If there is a match determined in Step 1150, the method proceeds to Step 1160 in which the relevant advertising page or banner corresponding to the extracted content data is selected or generated.

In Step 1170, the selected or generated banner ad is combined with the video or website to thereby provide the targeted information on the nearest reseller to the

mobile terminal. The reseller information can be handled by application server 130 or it can be forwarded to the appropriate links. The reseller information may include, for example, the nearest shop selling products under the

5   selected banner, a map of the area surrounding the shop, special offers of the reseller, hours of operation, availability of product, and an indication of all products under the banner. In this way, the user viewing streaming video on his or her mobile terminal receives

10   relevant advertising directly related to the location of the mobile terminal.

While any locationing method may be used with this invention, a preferred embodiment uses a 3rd generation Mobile IP Telephony network as shown in Fig. 12. The

15   blocks in Fig. 12 represent different functionalities and do not necessarily correspond to different discrete network elements.

The location services are supported by elements throughout the network. Some services are embedded in

20   conventional network elements, such as the Radio Network Controller (RNC), Mobile Services Switching Center (MSC) and Service GPRS Support Node (SGSN). In addition, some new network elements and interfaces are provided to support location services.

25   One new functionality element in the network is the Location Measurement Unit (LMU), which may or may not be integrated with one of Base Station Subsystems (BSS) in Node B 1200 to Node B 1210. The LMU primarily measures

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the Real Time Differences (RTD), Absolute Time Difference
(ATD), or any other kind of radio interface timing of the
signals transmitted by the base stations. These
assistance measurements obtained by the LMU are generic
5   status information and can be used by more than one
positioning method. The measurements may consist of
location measurements specific to one mobile used to
compute the location of that mobile or assistance
measurements specific to all mobiles in a certain
10   geographic area.

All location, timing difference and assistance
measurements obtained by an LMU are supplied to a
particular Serving RNC 1220 (SRNC) associated with the
base station having the LMU functionality. Instructions
15   concerning the timing, the nature and any periodicity of
those measurements are either provided by the SRNC 1220
or are pre-administered in the base station.

In GSM location services, the LMU is a separate
element from the GSM network. The communication between
20   the GSM network and LMU is done through GSM air-
interface. In the Universal Mobile Telecommunication
System (UMTS) location services, the LMU functionality is
integrated into the base station, preferably without
technical restrictions, at least when an Idle Slot
25   Forward Link - Time Difference of Arrival (ISFL-TDOA)
method is used.

The Mobile Terminal (MT) 153 may be involved in
various levels in the positioning procedures depending on

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the positioning method employed. In addition, the role
of MT 153 is closely related to the positioning approach
used in the system. For example, the functionality of MT
153 may or may not encompass location calculation.

5   Preferably, it can initiate a location service by making
a request to the network for positioning (network
assisted positioning). If it supports the use of Idle
Slot Downlink (IS-DL) sets, then it also performs the
following functions:

10   1)   measures and stores the signal during idle
periods;

           2)   correlates with different BCH codes between the
idle periods;

           3)   determines the arrival time of the first

15   detectable path, both for the serving Base Station
Subsystem (BSS) and other BSSs that it detects;

           4)   determines when the idle period occurs; and

           5)   reports the results back to the network.

       Each Node-B is able to shut down transmission during

20   the idle period. This function can be predefined in Node
B or can be controlled by RNC. Each Node-B also can
handle the functionality of the LMU including the
functionality of the Positioning Signal Measurement
Function (PSMF) and Location System Operation Function

25   (LSOF). Thus, it is responsible for gathering
uplink/downlink radio signal measurements for calculation
of a mobile's position. It is also involved in overall
operating of location services in the network.

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The SRNC 402 in the Universal Terrestrial Radio
Access Network (UTRAN) contains functionality required to
support location services and procedures between the LMU
and location service entities in one Public Land Mobile

5   Network (PLMN). It preferably controls the TDOA IS-DL
procedures periodically or according to predetermined
parameters, handles each Node-B's power ceasing period
and performs the Location System Operation Function
(LSOF), Positioning Radio Coordination Function (PRCF),

10   Power Calculation Function (PCF), and Positioning Radio
Resource Management (PRRM) entities. This includes
provisioning of data, positioning capabilities, location
services operation, location calculation, gathering
uplink or downlink radio signal measurements for mobile

15   position calculation, managing the positioning of a
mobile through overall coordination, reservation and
scheduling of resources (including Forward Access
Channel/Random Access Channel (FACH/RACH) or Dedicated
Channel (DCH)) required to perform positioning

20   measurements of a mobile terminal 153, and controlling
the location services radio accesses. SRNC 1220 also
calculates the final location estimate and accuracy.

The SRNC 1220 controls a number of LMUs for the
purpose of obtaining radio interface measurements to

25   locate or help locate MT 153 in the area that it serves.
The SRNC 1220 is administered with capabilities and types
of measurements produced by each of its LMUs. The
location measurements returned by an LMU to an SRNC 1220

have a generic status and can be used for more than one positioning method (including Time of Arrival (TOA)).

Signaling between an SRNC 1220 and LMU is transferred via the Iub interface, and in some specific periods, via Iur interfaces. The Iur interface supports inter-RNC soft handovers, including location services. Whenever an inter-RNC soft handover occurs Iur supports the functionality of the positioning entities in RNCS, including PCF, PRRM, Positioning Signal Measurement Function (PSMF) and LSOF. In case of SRNC relocation, Iur supports the relocation mechanisms to transfer the PCF, PRRM, PSMF and LSOF functionality from SRNC to Drift RNC (DRNC) in order for DRNCs to be able to handle the responsibility of SRNC in location service processes.

UTRAN 1230 is involved in the handling of various positioning procedures and RAN level overall controlling of location services. It controls an Idle Slot Downlink (IS-DL) method and manages overall coordination and scheduling of resources required to perform positioning of the mobile. In a networkbased positioning approach, UTRAN 1230 calculates the final "location es-timate and accuracy and controls a number of LMU/Node B 1200 to 1210 for the purpose of obtaining radio interface measurements to locate or help locate mobile terminal 153 in the serving area.

Generally, UTRAN 1230 provides Cell-id and, timing related data to 3G-MSC 1240. The 3G-MSC 1240 is similar to the MSC in a GSM,network, but the Serving Mobile

Location Center (SMLC) functionality may be integrated into SRNC 1120. The functions of 3G-MSC 1240 are billing, coordination, location requests, authorizations of mobile terminals and managing call-related and non-
5   call related positioning requests and operations of the location services.

Since SGSN 1250 has independent mobility management, UT 1230 instead provides Cell-id to SGSN 1250. The location services parameters are included in the lu
10   interface between RNCs 1220 and 3G-MSC 1240 and SGSN 1250. The SGSN is similar to the MSC. The functions of the SGSN are charging, coordination, authorizations of mobile terminals and managing positioning requests and operations of the location services as far as the packet
15   switch accesses are concerned. If the mobile stations support both network-based and mobile-based positioning, the RNC 1220 calculates the position of the mobile when a mobile-based positioning is applied by gathering uplink/downlink (UL/DL) radio signal measurements. The
20   RNC 1220 sends the location information to the UE or to the SGSN. If the SGSN receives the location information, it sends the location information to the CSCF, to the PSAP, or to the GMLC.

The Iu interface transforms coordinate estimates of
25   MT 153 over Radio Access Network Application Part (RANAP) protocol from RNC 1230 to 3G-MSC 1240 and SGSN 1250 and MT 153 positioning related NAS messages, including paging, authentication, etc. messages over RANAP

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protocol. The interface also maps the location service Quality of Service (QoS) attributes and handles states information between UTRAN 1230 and 3G-MSC 1240.

In a situation where the Mobile Terminal is connected to an external server via IP, the server might want to locate the Mobile Terminal. If the Mobile Terminal is using dynamic IP addressing, the address has to be translated to an understandable address or location request has to be processed otherwise.

The external server could request the GGSN to provide the identity behind the given dynamic IP address. The GGSN can map the dynamic TP address to a MSISDN number, which is used by the external server to locate the Mobile Terminal via normal positioning methods. Alternatively, an IP port number can be reserved for allocation request use in the Mobile Terminal. The external application can then use the dynamic IP address and known (standardized) port number to deliver a positioning request to the Mobile Terminal. The Mobile Terminal then requests its own position via normal positioning procedures, and delivers the result to the external terminal.

Another entirely new functional block is the Gateway Mobile Location Center (GMLC) 1260, which acts as a gateway between Location Service (LCS) clients and the network. GMLC 1260 receives and handles service requests for location information for an indicated mobile phone from external clients, activates the location systems, if

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needed, and returns the result to the client. GMLC 1260 may request routing information from HLR 1270 or SGSN 1240. After performing registration authorization, it sends a positioning request to and receives final

5   location estimates from 3G-MSC 1250 and SGSN 1240.

Home Location Register 1270 contains location services subscription data and routing information concerning subscriber calls. HLR 1270 is accessible from GMLC 1260 via a Mobile Application Part (MAP) interface.

10   The external location services client 1280 may be any sort of service application offered by a service provider or content provider. Client 1280 is closely related to the variety of available services. Sometime the Mobile Terminal 153 or a service application in the

15   Mobile Terminal 153 is the client.

In addition to changes in the main interfaces (i.e., Uu, Iub, Iur and Iu) of the network, there are also some interfaces defined to support location services. The Le interface between GMLC 1260 and external location

20   services client 1280 provides the reference point for transforming information transferred between GMLC 1260 and external location services client 1280. This information includes the positioning request and the final result of the positioning process.

25   The Lh interface passes routing information from HLR 1270 to GMLC 1260 and supports any mobility management related database in HLR 1270. It can also be used by GMLC 1260 to request the address of a visited MSC or SGSN

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for a particular mobile terminal whose location has been requested. It is preferably a type of MAP interface and may be implemented over a SS7 signaling network or possibly over IP protocol (MAP over IP). The Lg

5   interface allows 3G-MSC 1250 to access GMLC 1260 (Home PLMN or Visited PLMN). The interface transforms subscriber information needed, for example, for authorization and positioning access routing. It can be used by GMLC 1260 to convey a location request to the MSC

10   or SGSN currently serving a particular Mobile Terminal whose location was requested or by an MSC or SGSN to return location results to GMLC 1260. It is preferably a type of MAP interface and may be implemented over a SS7 signaling network or possibly over IP protocol (MAP over

15   IP).

The Lg' interface allows SGSN 1240 to access GMLC 1260 (Home PLMN or Visited PLMN). It may be identical to the Lg interface, but is labeled differently in Fig. 4 to show that it may also be different. The interface

20   transforms subscriber information needed, for example, for authorization and positioning access routing. It is preferably a type of MAP interface and may be implemented over a SS7 signaling network or possibly over IP protocol (MAP over IP).

25   Preferably, the MAP interfaces are as similar as possible to the MAP interfaces defined for location services in the GSM network. Because there is no Serving MLC (SMLC) in UMTS, the MAP interface between SMLC and

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VMSC is not needed. The locations services for GSM do not yet include GPRS, so the GPRS part of the UMTS, network is added to the MAP signaling. It is feasible to use the same MAP interface between GMLC and SGSN, than

5   between GMLC and 3G-MSC.

While there has been illustrated and described what are considered to be examples of embodiments of the present invention, it will be understood by those skilled in the art that various changes and modifications may be

10   made, and equivalents may be substituted for elements thereof without departing from the true scope of the present invention. Furthermore, many modifications may be made to adapt a particular situation to the teachings of the present invention without departing from the

15   central scope of the present invention. Therefore, it is intended that the present invention not be limited to the particular embodiments disclosed rather that the present invention includes all embodiments falling within the scope of the appended claims.